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Journal of the Society of Arts.

FRIDAY, DECEMBER 8, 1865.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock:—

December 13.—"On London Milk." By J. Chalmers Morton, Esq.

December 20.—"On Parkesine, its Composition, Manufacture, and Uses. By Owen Rowland, Esq.

Cantor Lectures.

Owing to the state of Mr. Hastings' health the two Lectures announced for Monday evenings, the 11th and 18th inst., are unavoidably POSTPONED till after Christmas, and will be delivered on Monday evenings the 15th and 22nd of January.

The tickets already issued will be available on these evenings.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

Second Lecture.—Monday, December 4.

The Effects on the Discovery of the Precious Metals on Modern Civilisation. By G. W. Hastings, Esq., LL.D.

The following is a summary of Mr. Hastings' lecture:*—There is a striking analogy between the operation of the forces which mould the surface of the earth and of those which affect the progress of human society. Geological periods of quiescence and disturbance may be traced in succession, giving rise to new continents, new climates, new physical conditions, producing new races of animals and plants. Social conditions are subject to similar mutations, no doubt regulated by laws equally binding and ascertainable. Long periods of repose are followed by convulsion, giving birth to new states of society and fresh forms of government. A striking illustration is to be found in the irruption of the northern tribes into the Roman empire, which broke up the long tranquillity of the civilised world, and gave rise to the various nations of modern Europe. The habit of migration, one of the most powerful of the moral forces of society, though arising from a strictly physical cause, the pressure of population on subsistence, was the lever of that mighty change. When the flood of conquest settled down, European society emerged under altered conditions, and, amongst others, with respect to the supply of the precious metals. The drain to the east, with a stationary or diminishing production, had reduced their amount in the latter days of the empire, an effect immensely increased by the general hoarding consequent on a period of disturbance. The scarcity of silver and gold during the early part of the middle ages is sufficiently proved by the high price of those metals; a small silver coin being an ordinary fine, and the salary of an important officer of state being hardly equal to the wages of a domestic servant of the present day. The trade of the Lower Empire and that of the Venetians and Genoese seem to have produced little effect on the supply, and there is no doubt that the amount afloat towards the end of the fifteenth century (estimated at thirty-four millions), was insufficient for the wants of the new civilisation that had sprung up with so much vigour on the ruins of the old. The consequence, at a later date, would have been inconvertible paper money; in mediæval times the debasement of the coinage was an equivalent resource, and practised systematically in some countries, as in France and Scotland. But a new physical force became known and used, magnetism applied to navigation in the compass; the sphere of European energy was enlarged to the habitable globe, and civilisation received a new impulse. From the discovery of America in 1492 to 1545, the amount of the precious metals imported into Europe was about 28½ millions, and without apparent effect on prices. In 1545 the great silver mine of Potosi was opened, and the amount imported in the much shorter period between 1545 and 1573 was estimated at 64 millions. The effect of this influx was a rise in prices, in other words a fall in the value of the precious metals, as proved by many records, public and private, of the time. In 1574 the process of obtaining silver by amalgamation with mercury was discovered, which was followed by a still greater influx of the commodity, and still further depreciation in value. Towards the end of Elizabeth's reign the change in the value of money began to be seriously felt, both by individuals and by the revenue of the Crown; and there can be little doubt that the impoverishment of the Crown, owing to this cause, was one of the prime moving forces of the political struggles in the succeeding reigns, with their consequences to the Constitution of the country. The distress experienced at this time by the labouring population, evinced by the enactment of a poor-law, and by their clamour for legislative regulation of prices and wages, was owing to the same cause. It has been most wrongly attributed to the dissolution of monasteries, an event which must have tended to mitigate the evil by throwing land on the market and fostering enterprise; and the fallacy is conclusively shown by the fact that Spain, of all countries the most conservative of mediœval monasteries, suffered at precisely the same time from similar inconveniences. About 1770 another considerable rise in prices took place, referred to both by Hume and Adam Smith, though without adequate appreciation of its real cause, viz., the constant supply of gold and silver during the 18th century, till towards its close they were being flung on the market (and strictly as articles of commerce, the supply for currency purposes having reached saturation point) at the rate of more than seven millions yearly. The great war, however, caused a diminution of the supply, the subsequent revolutions in South America ruined the mines, and for a time the trade collapsed. It is remarkable that this was just the period of the suspension of cash payments, and that when, after the period of disturbance, British capital was applied to Mexican and Peruvian mining, and the supply rose, cash payments were resumed. If other conditions had remained the same, no doubt this renewal of the supply of the precious metals must have led to another rise in prices, but it was about this time that one more of the great physical forces which propel civilisation was added to the resources of mankind. The expansive power of steam, already applied to manufactures, was utilised for the purposes of locomotion by land and water;

*** In the summary of the first lecture, at line 30 from the end, for "north-eastern," *read* "north-western."**

the intercommunication of mankind, and the migration of the European race, which had received a vast impulse from the application of the compass, were still more energetically promoted; the increase in the number of civilised communities and the general expansion of trade, caused a demand for specie which more than counterbalanced the supply; the constant agitation for a paper currency, and other signs, make it a probable surmise that the amount of the precious metals afloat in the market (while Europe was dependent on South American production alone) was becoming inadequate to the demand. But at this time occurred one of those events which are landmarks in history; for the first time since the destruction of the Roman Empire the nations of Europe witnessed the discovery of gold near to their own doors. The slopes of the Ural mountains were found to be prolific in the metal, and science had an opportunity of studying its geological conditions. Sir Roderick Murchison, whose travels in the Russian dominions gave him peculiar facilities for accurate observation, mastered the problem of gold discovery so completely, that he prophesied the finding of Australian gold-fields before an ounce of the metal had been seen in that continent. A knowledge of the probable sites of gold led to search, and in California, Australia, New Zealand, and other countries, diggings are now in operation which have raised the annual supply to at least forty millions. Now, taking Humboldt's calculation of 400 millions as the amount thrown into Europe from the discovery of America up to the date of the recent supplies, the question is—what is to be the effect of so startling an addition as that which can double the total in ten years? It may be well to note, first of all, the actual effects which have followed. Precisely as the search after the precious metals in ancient times led to the colonisation of the shores of the Mediterranean to their remotest points, and the consequent spread of civilisation and new political ideas, so now the coasts of the Pacific, north and south, are being peopled, in a great measure from the same cause, by a vigorous race, who carry with them over the globe the principles of self-government and international comity. An immense increase in trade and industrial production of all kinds, adding daily to the accumulated wealth of the world, and thereby to the independence, comfort and happiness of millions, is another result; one which no doubt would equally follow from an addition to wealth in any other form, but which as a fact does follow from gold discovery more rapidly than from any other known cause.[*] Further, it is no small benefit that an impulse has been given in all civilised countries to the establishment of a sound currency, by which is meant a currency whose real value is equal to its nominal value; and to the discrediting of expedients of currency deterioration, such as in mediæval times led to debasement of the coinage, and find their modern equivalent in the delusions of inconvertible paper money. That there has been a rise in the prices of ordinary commodities around us needs no demonstration; but how far this is owing to any fall in the value of the precious metals is another question, and one which can only be fully answered by the future; but the local nature of the rise in many cases must suggest doubts, seeing that any real fall must, in the present state of intercommunication, operate pretty equally over the whole European market. M. Chevalier, in his able work on gold, predicted that a change in value quite as great as that which happened in the sixteenth century would be the result of the new supply, and he has uttered an emphatic warning to his own Government and other nations. In this volume he described France as the parachute which was breaking the fall of gold, on account of the temporary demand made for that metal by the French Government during the substitution of gold coin for silver. Looking to the date of Chevalier's work, and the subsequent teaching of experience, it is impossible to resist the observation that the parachute is a long time coming down. In fact, M. Chevalier seems to have underestimated the various retarding influences, several of which are quite as potent as the change in the French coinage. No doubt the fluctuation in relative value produced by gold discoveries is great, even enormous, when applied to limited areas, because in such cases there can be no fresh demand adequate to balance the sudden and inordinate supply;[*] but in the market of the world the want of one district drains the abundance of another, and gold, like water, finds its own level. Why did not prices rise between 1492 and 1545? Because the twenty-eight millions imported only filled up the vacuum previously existing, only slaked, as it were, the thirst of European commerce. No doubt so soon as the saturation point had been reached, the further supply at once began to tell, and with what results we know; but there are many causes which will retard the reaching of that point at the present day. France is not the only country in which gold is being substituted for silver for currency purposes; our Indian empire will long create a demand, and there are States in Europe, such as Austria, which are almost destitute of a metallic medium. The extension of public works, such as railways, in so many parts of the world keeps up a demand for specie, and it is difficult to exaggerate the effect of the present increase of trade, manufacture, and population in so many quarters. There is also a self-acting check on gold production which has been too much overlooked; all the best gold fields are situated at a considerable distance from Europe, and in thinly-populated countries, where labour is in great demand; consequently, a very moderate depreciation in the value of that metal will suffice to bring down the remuneration of the diggers' labour below the rate of wages earned by manual work around them, and, therefore, to check the supply. Under any circumstances it may be considered certain that no sudden shock will be felt, and that the evils of change of value will be consequently mitigated. In connexion with that part of the subject, the soundness of Adam Smith's opinion that it did not matter whether the precious metals were of high or low value, may be questioned. If they are of high value, or in other words if their amount is small relative to other commodities, that value is likely to be disturbed by every discovery, however slight in its nature, of any new supply; whereas, if the amount in the market be large, that is if their value be low, a small increase will not operate to any appreciable degree, and even a large increase will be much less felt.[†] It is satisfactory to reflect that the evils of the change, whatever it may be, are temporary, while the good effects of gold discovery remain; that the results of stimulated enterprise, enlarged commerce, extended colonisation, increased industrial production, do not pass away, but that their benefits are reaped fifty-fold in the happiness of future generations. If, too, there is a similarity between the consequences of the discovery of the precious metals in ancient and modern times, there is also this blessed difference, that in the times of antiquity the mines were worked by slaves, and thus every new discovery added to the sum of human suffering, whereas now the diggings are worked by free labour, and all the social results that follow are in favour of the prosperity of the artizan classes. In fact, a great social upheaval is fast taking place, and comfort, even luxury, physical and intellectual, is spreading through the bulk of the population. It may therefore with truth be said, as was stated at the commencement of the first lecture, that the record of the progress and results of the discoveries of the precious metals would form, if a history of civilisation were to be adequately written, one of its most interesting and important chapters.

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[*] That is, if as large and rapid an emigration had taken place to the Australian settlements for the purpose of growing wool and cotton, and an amount been produced equivalent in value to the gold that has been mined, the results to the wealth of the world would have been the same. But no such emigration did or would take place. We must not overlook the moral forces of society. The elements of hope and imagination under certain circumstances overpower the dictates of reason and the calculations of the economist. The *auri sacra fames* has often furnished an illustration.

[*] As in the instance mentioned by Strabo of the effect caused in his own time on the prices of Italy by the discovery of some gold diggings on the south slopes of the Alps. The almost total disorganisation of the labour market in Australia, which for a time ensued on the gold discoveries, is still more remarkable.

[†] Chevalier's arguments in favour of the substitution of silver for gold as the standard, are based on the supposed greater fixity in value of the former metal. But can this be relied on? The production of silver depends in a great measure on the price of mercury; and the recent discoveries of large deposits of mercury in California and the adjacent Mexican provinces suggest the probability of a largely-increased supply of silver.

Fourth Ordinary Meeting.

Wednesday, December 6th, 1865; Henry Cole, Esq., C.B., Vice-President of the Society in the chair.

The following candidates were proposed for election as members of the Society:—

Ashbury, John, 27, Great George-street, Westminster, S.W.
Bikélas, D., 19, Old Broad-street, E.C.
Blackburn, James, Droylsden. Manchester.
Booth, J. P., Bellevue-house, Cork.
Cursetjee, Manackjee, Hill-house, Southampton.
Ellis, Edward, 9, Fenchurch-street, E.C.
Hindley, D. P., 10, Old Jewry-chambers, E.C.
Laycock, William E., Portobello-place, Sheffield.
Maxwell, Nicholas M., 4, Allhallows-chambers, Lombard-street, E.C.
Nash, Arthur Briscoe, 25, Cornhill, E.C.
Nixon, Joseph, 104, Fore-street, E.C.
Palmer, George Harry, 2, Middle Temple-lane, E.C.
Robinson, A. A., 137, Fenchurch-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Allen, Matthew, 61, Tabernacle-walk, E.C.
Barfoot, Edwin, 32, St. Martin's-le-Grand, E.C.
Barry, Herbert, 57, Old Broad-street, E.C.
Bowker, James, 1, Gray's-inn-square, W.C.
Brook, William Pitt, 1 and 2, Poultry, E.C.
Brooks, William Cunliffe, 81, Lombard-street, E.C.
Brown, John, 15, Rolls-buildings, Fetter-lane, E.C.
Carttar, C. Graham, 7, Skinner's-place, Sise-lane, E.C.
Dawnay, Archibald Davis, 58, Campbell-road, E., and 11, Park-street, Westminster, S.W.
Dickinson, George Francis, 17, Gracechurch-street, E.C., and Farleigh House, Surbiton, S.W.
Dornbusch, George, South Sea House, Threadneedle-street, E.C.
Evans, Charles John, 5, Princes-street, Bank, E.C.
Harris, Rev. Charles, Summer-town, Wandsworth, S.W.
Hart, John Walter, 60, St. Mary Axe, E.C.
Harwood, Edward, jun., 33, Abchurch-lane, E.C.
Hellaby, Joseph, 122, Wood-street, E.C.
Henshaw, William, 2, Sun-street, Bishopsgate, E.C.
Hibbert, Edward, 7, Jewry-street, E.C.
Langton, Rivers, 15, Laurence Pountney-lane, E.C.
Masters, Joseph Reynolds, 78, New Bond-street, W.
Morley, Henry, 4, Frederick-villas, East Brixton, S.
Nash, Alfred George, 13, Basinghall-street, E.C.
Nickisson, John Charles, 16, Watling street, E.C.
Overend, William, Q.C., 6, Queen's Gardens, Hyde Park, W.
Parker, Josiah, 44, St. Paul's Church-yard, E.C.
Price, Frederick Wakefield, 31, Upper Seymour-street, W.
Smith, S. T., Rivers Commission Office, 2, Victoria-street, S.W.
Vernon, Hon. A., Sudbury-hall, Derby

The Paper read was—

ON THE GRAPHOTYPE, A PROCESS FOR PRODUCING FROM DRAWINGS, BLOCKS FOR SURFACE PRINTING.

By Henry Fitz-Cook, Esq.

The subject of art-processes for the reproduction of drawings, both for surface printing and otherwise, has occupied much of the attention of this Society during the last twenty-five years, and been the occasion of many interesting discussions in this room, but none of the processes professing to make blocks for surface printing have gone so direct to the point of making the drawing engrave itself as the one I am about to describe, or have at all approached it in economy, both of time and cost.

Most of the previous processes, such as Glyphography, Gypsography, Silvertype, &c., have aimed at making the drawing form the mould from which the block was to be cast, entailing very great uncertainty in the execution of the drawing, and requiring the artist at the same time to be a skilful engraver to produce any satisfactory results. a great portion of the block being produced by the ordinary methods of engraving.

In the directions to artists working in Palmer's Glyphography—really the most successful of all surface processes hitherto—there appears the following passage:—

"As the light and free touches that are sometimes dispersed over the shades, are very troublesome to leave, and, when accomplished, are often stiff and formal, they should be altogether removed from the drawing, and put in with the graver upon the copper block. Nearly every kind of broad, flat shade, (technically known as tinting among wood-engravers), can very readily be done in this stage of the process, which, indeed, will be the best for almost all work needed upon the darkest tones."

Again, further on, the artist is invited to leave "skies and backgrounds solid black, lay an etching ground on the block, etch and bite it in with acid, as a copper-plate engraver would do, but with this difference, that while he bites for darks, you must bite for lights," thus rendering the work doubly difficult to any one but an engraver.

Others have sought to place the drawing in relief by biting away the ground with acid. It is obvious, however, that to get the relief necessary for printing at press, the acid would have a lateral action, and the fine lines, at all events, be rotten for want of support. In fact, either the want of depth, or of the V form of the interstices between the lines—the form necessarily made by the graver—has been the stumbling-block of all processes hitherto, though most of them have been capable of producing some good results, as specimens, with the aid of subsequent graver work; and probably, had the inventors been practically acquainted with engraving, the processes might have been made of some commercial value.

There is also one other process for producing a surface print, but as it is not capable of being printed by the ordinary type machine, it hardly comes under the category of a surface block. I allude to the Anastatic process which has lately been further developed in Col. James's Art of Photolithography. In these processes the drawing or photograph is transferred to the stone or zinc by the rolling press, which of course has a tendency, even in the most careful hands, to squeeze out and therefore thicken the lines of the drawing; but though beautiful results have been obtained in the process of photolithography by Osborne and one or two others, the cost must always be a serious obstacle to its general adoption.

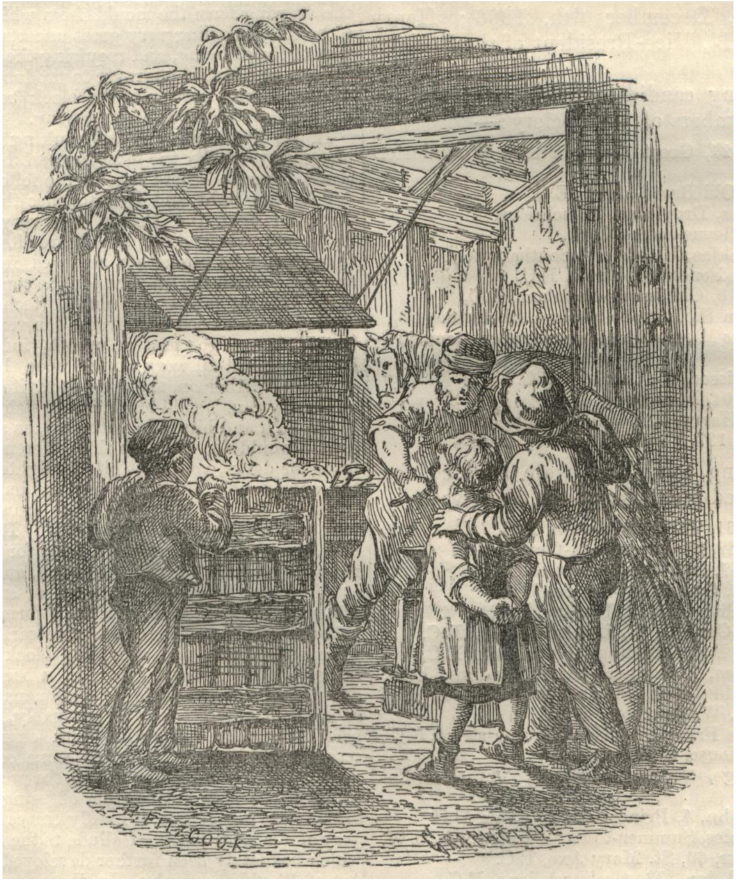
Artists engaged in drawing for engraving have long felt the want of some easy and direct method of reproducing their works without the impress of another hand. The cleverest engraver, with the utmost exercise of his skill, can at best only produce an approximation to the original, too generally losing entirely the points which the artist has laboured most successfully to produce; and only the artist himself can tell how great is the shortcoming.

We constantly hear it said in defence, that "the engraver often improves upon the drawing." To my mind there can be no greater condemnation of the practice of engravers; and, though doubtless true, as regards very inferior works, I venture to say it is never the case with a real work of art, which must of necessity suffer in the translation.

The Graphotype process, to which I have to call your attention, is absolutely free from most of the objections which have been urged against previous methods. Gravers would have to be cut on purpose to make an engraving equally deep. Undercutting or any other than the V-form, would be a mechanical impossibility. The marvellous economy of time—the drawing being placed in relief, or engraved, if the term may be allowed, in less minutes than it would take hours to engrave the same subject on wood—in that respect resembling the intaglio process of Mr. George Wallis—as well as the trifling cost of execution—must lead eventually to its very general adoption, whatever present objection may be urged against it from its novelty.

I have a drawing here (Fig. 1) which is ready for engraving, and when it has been examined it will be engraved, that you may note the time taken in its execution. A drawing is also being made for me (Fig. 2), which will be engraved and hardened, before the present meeting is concluded, and printed with the paper in the Society's Journal. I have also a piece of machine ruling (Fig. 3) now being executed, which will be similarly engraved and printed. The print I have in my hand (Fig. 4), and of which any one may take a copy, will, I think, sufficiently prove its suitability to the roughest form of steam printing; but in case any one should doubt whether it may not have required extra care or time to make ready, I have here the answer of Mr. Trounce, the Society's printer, to the question. He says:—"I forward the copies of your block and title-page. I hope they are sufficiently well printed for your present purpose. Had we been less busy we should have printed them in a somewhat better style; sundry defects, which you will not fail to discover, be good enough to attribute to the fact of our being unable to bestow as much time on the 'bringing-up' as is usually devoted to cuts. The block itself presents no difficulty whatever, in my opinion; and, what is of no little value, though of a negative character, I have not heard from the machinist the slightest hint of a difficulty. I have purposely used ordinary book-work ink; and I have no doubt that at a hand-press, and with wood-cut ink, work quite equal to that from the finest wood-cuts could be produced from blocks by the Graphotype process."

Fig. 1

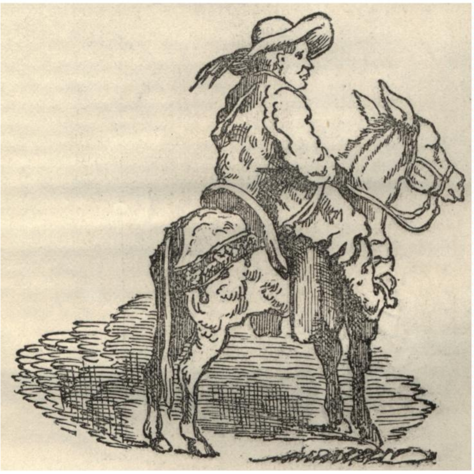


Unlike most of the other processes which have been discussed by this Society, the discovery of the principle on which the Graphotype process is based was not the result of design or calculation, but entirely accidental and unpremeditated. It is due to Mr. De Witt Clinton Hitchcock, one of the foremost draughtsmen as well as engravers in the city of New York.

In the summer of 1860, whilst engaged in the pursuit of his art, the discovery was made in the following manner:—In the course of making a drawing on box-wood, he found it necessary to alter a portion of his design by erasing it and re-whitening the exposed surface of the wood. The material used for this purpose was the enamelled surface of an ordinary visiting card, softened by water and a brush, a method known to most draughtsmen on wood. This card happened to be one printed from a copper plate, and after the removal of all the enamelling, as described, the artist discovered that the printed letters were undisturbed, and standing up in bold relief.

Mr. Hitchcock undoubtedly was not the first or only draughtsman who had used a card in this way or with the same result, but it must be conceded that he was the only one who perceived in this mutilated visiting card the basis of a mode of producing a relief printing-plate, without the skill of the engraver, and who proceeded to experiment thereon.

Fig 2.



The first trial was upon a piece of chalk one inch in thickness, sawed from the ordinary lump, and smoothly surfaced by scraping. The ink used was silicate of potash, commonly termed liquid glass, coloured with indigo; with this and a quill pen, a drawing four by six inches was made.

The inventor well knew that the application of water to his chalk block would undermine the lines, and consequently destroy the drawing, he, therefore, departed from the method used with the visiting card, and, with the aid of a tooth-brush, pulverised or disintegrated the surface of the chalk not immediately drawn upon.

The lines of the drawing being literally composed of stone, withstood the assault of the tooth-brush, but the intervening particles of exposed chalk succumbed, and vanished in a cloud of snowy dust, leaving the impregnable lines standing in relief, inviting a proof of their strength by printing on paper. This could not be done until the whole mass of chalk was changed into stone, by saturating it with the liquid glass, and in half-an-hour the chalk engraving or block was inked and printed in the ordinary way on paper by burnishing.

Sawing and surfacing the chalk block, preparing the ink, making the drawing (quite an elaborate one), brushing it into relief, petrifying the block, and printing thereon occupied only four hours—a happy four hours for the inventor.

The new process now needed a name. It was a living fact, but the dead languages must be exhumed for its appellation. It was christened Graphotype, literally signifying a type made immediately from a drawing.

Prior to a second experiment it was thought necessary to use a substance of a finer and more uniform quality of grain than common lump chalk, so a cake of French white powder, used by ladies for improving their complexions, was obtained, and the result was highly satisfactory. The fact that these cakes of white beautifying powder were compactly formed by hydraulic pressure suggested a valuable improvement to the process.

No time was lost in manufacturing the necessary steel dies or boxes, and procuring the use of a powerful hydraulic press, with which blocks 12 inches square by 1 inch thick were formed of pulverised and finely-sifted chalk. These blocks were then subjected to a heat of 700 degrees, which, expelling all moisture, gave them much greater strength. The drawings on these blocks were made with steel and quill pens, and the brushing process for relieving the lines was carried to the depth of one-eighth of an inch. These blocks were printed at the ordinary hand printing press, but the material, though very strong, was too fragile and uncertain for constant use.

The next necessary improvement was to duplicate the original by means of stereotyping or electrotyping. The latter proved perfectly practicable, but alterations or corrections of the design—which I need hardly tell you must necessarily often occur in any process—all of which could readily be done on the stereotype, could not be satisfactorily made through the copper surface of the electrotype, notwithstanding Mr. Palmer's directions on the subject already quoted. Valuable improvements were the result of this new addition to the process. It would be tedious to listen to an account of all the experiments which followed this alteration—the disappointments, hopes deferred, and discouragements from friends which the inventor suffered for the space of eighteen months.

Great difficulties arose; the labours of a month were often lost in a minute, and steps retraced to the first principle, which stood always unchanged; its constancy was beyond suspicion. The ink line, once drawn, remained unalterable, and ever ready to reward the operation of brushing, and this portion of the process has never been altered.

In making the stereotyper's moulds from these blocks, they were found to absorb too great a quantity of oil; the new block, or, more properly, the new plate, was then composed and adopted, and has been in use without material alteration to the present time.

It was a well-known fact that the silicious ink spread on the plate, and produced a line somewhat thicker than was drawn. This was certainly detrimental to the process, but the existence of the fault could not be denied, for as the chalk was naturally porous it would absorb the ink laterally as well as vertically. It remained for a brother artist of the inventor, a Mr. Day, to make the improvements required in the graphotype drawing ink now so successfully used. I may also mention that Mr. Edward Roper, a London engraver, materially aided in improving the practical details of the process; and no doubt its success is to be attributed to the fact that none but those practically acquainted with art or engraving have been connected with its development.

With the approval of the original inventor, the European patents were granted to Mr. Day, and I will now give a general description of the whole process, as specified in the letters patent:—The best quality of French chalk is finely ground and precipitated in water. This precipitate is again pulverized and sifted. Thick sheets of zinc or other metal are cut to the required sizes, upon which the prepared chalk is re-sifted through wire cloth having 10,000 holes to the square inch. This is subjected to hydraulic pressure of 120 tons, the chalk receiving a gloss from the surface of a highly polished steel plate. In this condition the thickness of the zinc plate and compressed chalk is about that of an ordinary stereotype plate. The surface of the chalk is then made nearly non-absorbent by receiving a strong 'sizing,' which prevents the ink from penetrating, and, consequently, from spreading.

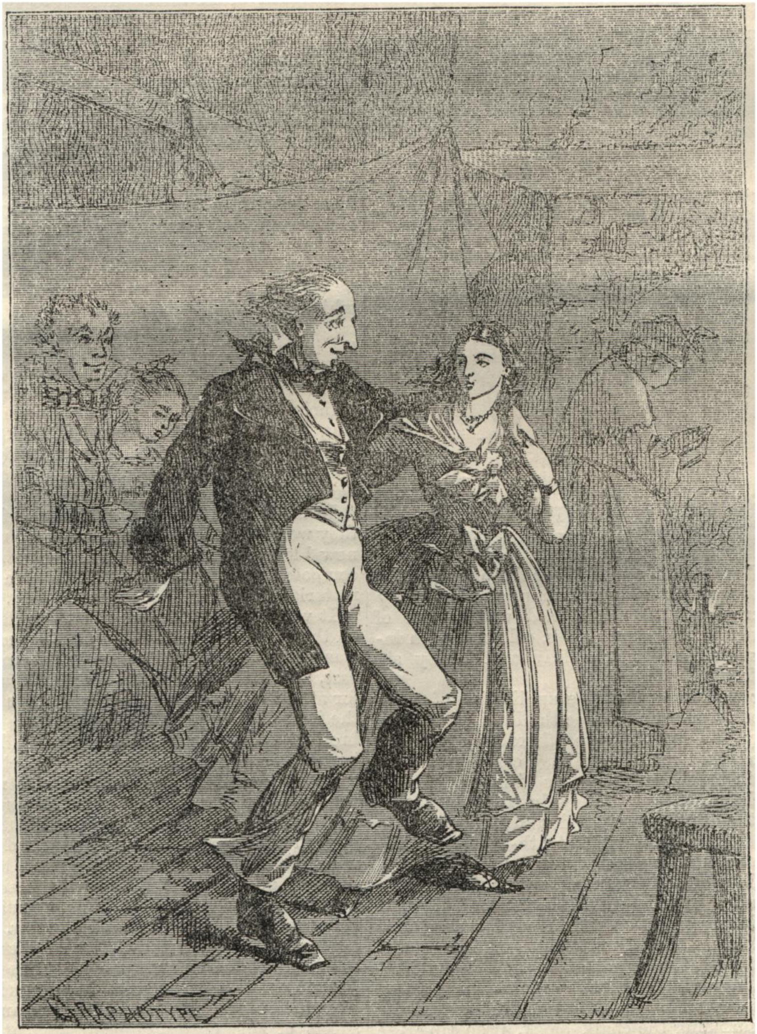
The ink, which, as I have said before, took two inventors months of labour to perfect, is, after all, nothing more than a very careful composition of glue and lamp-black; and, partaking as it does of the nature of varnish, it remains upon the surface, acting merely as a guard or protection to the chalk beneath the lines while undergoing the operation of brushing. In a like manner to drawing upon wood, the artist makes a red chalk tracing on the plate, and with sable hair pencils of various sizes draws his design line for line exactly as he desires it to appear when printed, the subject being of course reversed, as upon wood. The ink, which is black, dries instantly on being applied to the plate, so that one series of lines of any thickness may be immediately crossed by others.

The drawing is now ready to be brought into relief, or engraved, which is effected by the same means of disintegration as were first adopted by the inventor, not with the same tooth-brush, but with brushes composed of fitch-hair. Fine silk velvet is also used in connection with the brush. The chalk is then petrified with the liquid silex, and is ready for the stereotyper, who may, without injury to the original, make from it any number of moulds.

The process is so delicate that the impression of the thumb wetted with the graphotype ink, skeleton leaves, feathers, and other objects to which nature printing has been applied, can be made to give beautiful impressions from the type press, whilst the finest hair-line that the artist can make will stand equally well with the bolder work.

The graphotype process is also applicable to making

Fig. 3.



This plate was delivered to the artist ruled; the drawing, which took two hours to make, was exhibited in the room; it was engraved in fifteen minutes, stereotyped in three hours, and it required one hour's engraving to put in the "high lights."

the blocks or dies—usually cut on brass—with which the bookbinder embosses the covers of his books, and this conclusively proves, if anything were needed to do so, the depth obtained by the process, as at least three times the depth is required for this purpose as for printing at press.

In mechanical drawing the graphotype process cannot at present compete with other methods, inasmuch as the compass and rule are incapable of being used without damaging the chalk surface, and the absence of these aids very materially increases both the labour and cost of the drawing. This difficulty, however, no doubt will be speedily overcome when any one shall think it worth while to lay himself out for it. That mechanical work can be done well and quickly even at present, where cost is not a consideration, is proved by the engraving published in the *Journal* of the Society for the 13th of October, and in confirmation thereof I cannot do better than read the note appended to it by the Editor of the *Journal*:—" This illustration is one of the first applications of a new process for producing surface blocks from a drawing. It has been produced for this Society as an experiment. The drawing was placed in the hands of the artist on Wednesday morning, and the metal blocks, ready for the printer, were delivered the following day. It is right to state that, the drawing being of a geometric character in outline, the difficulty of production was greatly increased. It should be added that the drawing, having been placed in the hands of a wood engraver of eminence on Tuesday morning last, was returned by him with the statement that it was impossible to execute wood blocks in time for this week's *Journal*."

This engraving, however, produced without any preparation under such adverse circumstances, is not, of course, put forward as a specimen of what graphotype can do. The specimens exhibited in the room show far better evidence of its capabilities, though even they fall far short of exhibiting the full range of its power.

The ordinary engravers' ruling machine—by an ingenious adaptation, which you will have an opportunity of inspecting at the close of the meeting—is rendered available to this process for producing quiet water, flat skies, broad tints, and other purposes to which it is applied in steel engraving. In this case the line, instead of being ruled by a point, is made by a metal wheel, which touches but does not press upon the surface of the chalk. There is also a little arrangement for gradually feeding the wheels with ink.

As a matter of interest to the members and visitors present it now becomes necessary to say a few words on the manipulation of the drawings. When the process was first introduced to me I saw at once that the problem so long and anxiously sought had at length been solved, and though I had never previously made a line drawing with the brush—which, during the last four or five years has nearly superseded the pencil for drawing on wood—the first attempt I made confirmed my previous conviction. Since then, I have secured the co-operation of some of our best illustrators, Holman Hunt, J. D. Watson, Du Maurier, Morten, Hablot K. Browne, Florence Claxton, and others, whose first attempts are in the room for your inspection. None of them have, I believe, experienced any difficulty other than the strangeness which must necessarily attend the working on a new material, and most of them are enthusiastic at the results of their first trials.

Mr. Holman Hunt writes me as follows:—" I regard the process of drawing for book illustrations, called graphotye, with which 'Watts's Hymns' have been illuminated, to be the best yet adopted. The merit of the modern wood-cutters is very great, and the care which they bestow upon the blocks they cut deserves, oftentimes, the greatest thanks of the designer of the work; but, even under the most favourable treatment by the cutter, much of the original character of the drawing must necessarily be lost. Your new invention will preserve every peculiarity of style. A first experiment is scarcely a fair test of the capability of the process, but it has convinced me that when the tools are familiar to the draftsman he will find a means of expressing his ideas which he never had before except in etching on metal, which of course cannot be used in type printing."

Mr. Hablot K. Browne says:—"As far as I have tried the graphotype process, I like it very much, as it certainly has this advantage over ordinary wood-cutting—that it renders the artist's drawing more faithful."

Mr. J. D. Watson writes:—" I am much pleased with the result of my first trial in the graphotype process. It is certainly superior to anything I have seen. It remains to be seen how it will bear rough printing. I should like to see a good book with large drawings done in this way."

Mr. T. Morten also writes thus:—" I have not yet had the pleasure of seeing the complete work for which I did the graphotype drawing, but as far as my own experience of the process goes, it would seem to have several advantages over any existing method of illustration—for instance, the possibility of complex work being engraved with greater rapidity and at less cost than by the method now in general use."

I have also tested the process myself with every kind of execution which occurred to me, and found no practical obstacle to any. There is no greater difficulty in drawing on the chalk with the brush, than there is upon paper. It is as susceptible of after-touching and improving as the wood block, and is as well adapted to free, bold, sketching as to great elaboration; results can be obtained with ease such as no engraver can attempt, and new instances of its practical application and development are occurring, and must continue to occur every day. I feel confident, therefore, that when it becomes practically well-known, no real artist will care to submit his work to the tender mercies of the engraver, whilst he can have it so faithfully reproduced by these means.

To the author and publisher it not only opens the present means of saving half the cost of engraving—ultimately a much larger proportion—with the additional advantage of retaining the actual work of the artist he employs—but it will also enable works to be produced which could not otherwise have been undertaken. In periodical publications, its rapidity of execution, I have reason to know, will shortly work a great revolution.

In an article which appeared in the *Spectator* of Saturday last, the process is alluded to thus:—"We have good news for the pre-Raffaelites. There is some chance of their being able to establish an illustrated organ, a daily paper if they please, which shall popularise their views by reproducing whatever sketches they may contribute to it, not only with perfect accuracy, but with greater ease in *proportion* to the minute finish and detail of the drawing. It has long been a complaint against wood engraving that an artist could never be sure that he would not find the most telling strokes of his pencil simply omitted in the print; moreover, our artists have been constantly hampered by the necessity for simplifying their drawings in order to facilitate the process of engraving." The article then goes on to describe the process, with some inaccuracies, but in suggesting, as before quoted, a daily illustrated paper, it does not at all overstep the bounds either of possibility or probability, the proprietors of the patent being perfectly prepared to meet any capitalist on the question.

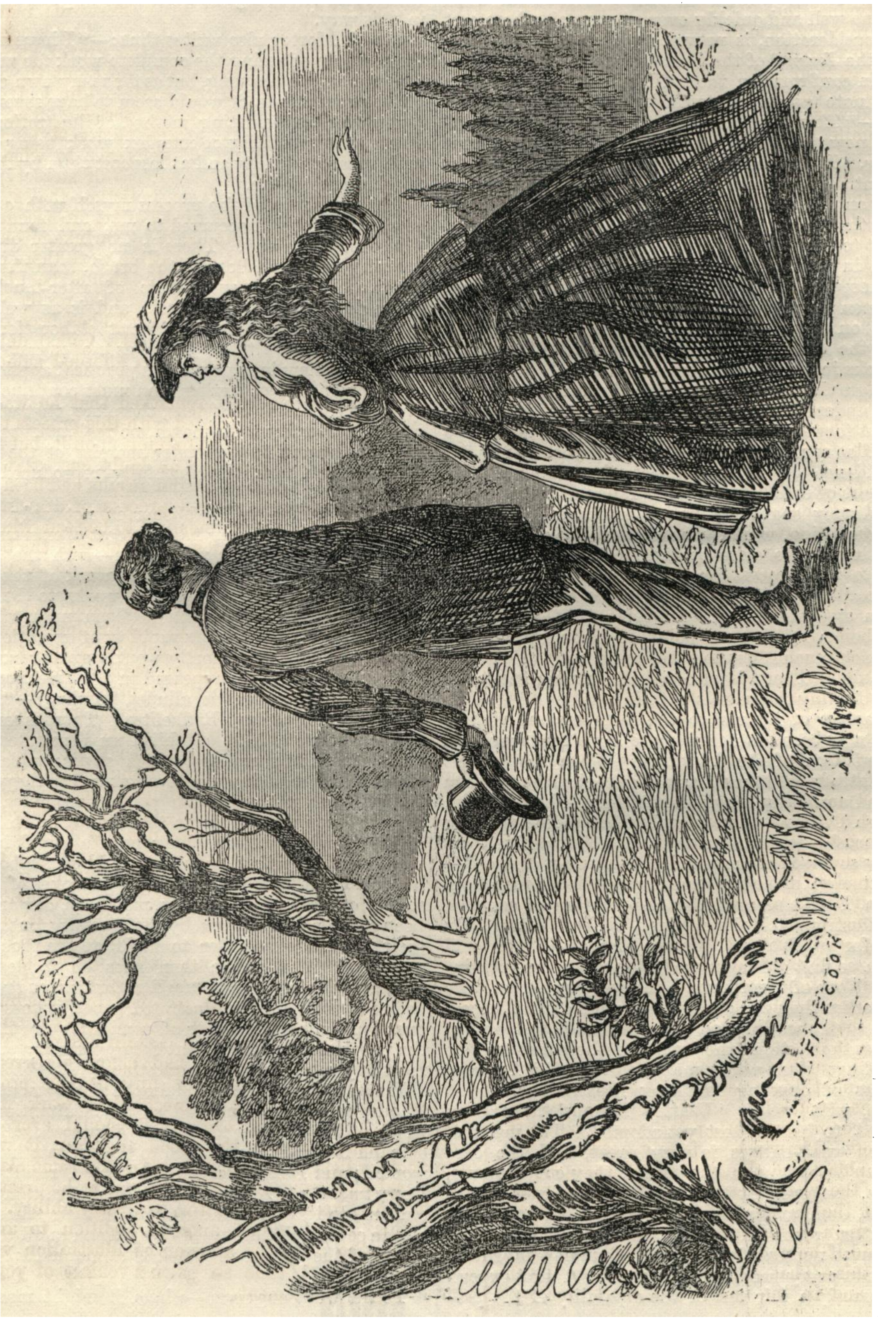
It also presents a new field for the employment of female labour, which has engaged so much attention of late. Much of the drawing for which the process will create a demand is peculiarly adapted to the delicate handling of women; and I expect great good would result were the Department of Art to direct the attention of their students to it, and have it taught in their schools. It is also in contemplation to employ women in all the departments of the process in which hard manual labour is not required.

To the wood engraver—whom it might most reasonably be expected to injure—I believe it will eventually be a boon rather than otherwise. Engravers of any ability are well fitted by their previous training to do with little trouble much of the drawing required, and those whose ability will not admit of the change, would be far better off at other employments than earning the wretched pittance they now do.

It has been objected to this process that in stereotyping much of the fine work would be lost by the well known shrinkage of the metal in cooling, and that in consequence stereotyping has been altogether abandoned for electrotyping as far as regards wood blocks. This however has been found to be a complete fallacy, and I think the specimens here exhibited will amply prove it.

The results which have been supposed to be due to shrinkage, are due instead to the indifferent manner in which stereotyping is generally performed in this country, for I can say without hesitation that no English stereotypes I have seen, at all compare with those from New York, notwithstanding that the metal from which the

Fig. 4.



latter are cast is imported from this country. There is also another reason why stereotyping from wood blocks has been given up as not satisfactory. The wood is porous, and therefore a perfectly clean mould is with difficulty obtained in plaster. The Graphotype plates, on the other hand, have a solid and beautifully polished surface, and consequently present no such difficulty. The same workman will turn out a perfect cast of a block, without appreciable shrinkage—for the shrinkage after all only amounts to one-eighth of an inch in a foot—whilst the next cast he makes from the same block will be half filled up by carelessness in the manipulation of the mould.

To electrotyping there is really greater objection. electrotypes are very seldom, if ever, flat, and the graphotype plates are always a dead level. Stereotyping can be done in an hour and a-half, whereas electrotyping takes at the least twenty-four hours. In either case, however, a good workman with proper care can turn out a perfect fac-simile, and electrotypes, having the preference where large numbers are required, can as easily be obtained from the stereotype as from the wood. Objections of this kind are really only the workman's excuse for turning out bad work.

In tendering this subject for notice and discussion by the Society, my object will have been attained if I have succeeded in showing that an acknowledged want is now supplied by this process, which brings the artist's mind nearer to us, and at the same time cheapens the reproduction of his work, thus placing real art more within the reach of the masses.

DISCUSSION.

The Chairman having briefly described the mechanical process of stereotyping as practised in the present day, remarked that there was one feature about the process now introduced to them which he had no doubt would be found extremely valuable. Many present had no doubt noticed the great difference between old and modern wood engravings. In the works of Albert Durer and the wood engravers of that period, the lines were very dark and strong, and these artists did not attempt the graduated shadows which were found in modern wood cuts. By this process the effect of the old wood cuts was easily obtained, and he had no doubt that Durer, Holbein, and the artists of their time would have received it with infinite satisfaction. He thought there was one little drawback to it, which he was afraid would always exist, that was the absence of that mellowness of tone which a wood block gave, as compared with the hungry, dry look which attended the use of stereotype plates. As to the difference between the electrotype and the stereotype, he preferred the former as giving a better impression; but, with regard to this process generally, they must take the good with the bad. Its great facility, great cheapness, and the fact of its giving an exact reproduction of the artist's own work, were strong points in its favour, and they must put up with any small drawbacks such as that he had just referred to. They were told at the beginning of the paper that this invention came about by accident, in the use of an ordinary enamelled visiting card. They were afterwards told that, after two months of experiment with inks of all kinds, it turned out that glue and lampblack were the proper ingredients for the purpose. It seemed that for this simple thing a patent had been taken out. That circumstance struck him forcibly, and he now confessed himself a convert, or perhaps a "pervert," on the subject of patents. Here was a purely accidental discovery that lampblack and glue were the proper operating media, and yet the world was not privileged to use this process without the payment of a royalty to the lucky person who hit upon the invention.

Mr. Gilks said if he understood this invention aright it amounted to this—That a picture was drawn by the artist on chalk, and in the course of a short time, by a process of induration, the drawing made upon the chalk surface became converted into a marble picture in relief, and while in that state it was a very perfect production. It appeared, however, that it could not be printed from direct, but it was necessary to resort to the secondary process of stereotyping. It had to go through a "middle passage"—a sort of "purgatory," but unfortunately unattended by the purifying effects implied by that term. He had been informed by Mr. Fitz-Cook that it was impossible to print from the original chalk or marble drawing, as it would instantly smash under the pressure, and that stereotyping was therefore resorted to, another alleged advantage of which was that if any lines of the drawing were afterwards required to be removed this could be done. The secondary process of stereotyping and using the graver appeared therefore to be necessary in order to work out the ideas of the artist, and he (Mr. Gilks) confessed he had great doubts with regard to all secondary processes on account of their uncertainty, and the process of stereotyping was especially uncertain. With all deference to what had been stated in the paper on the subject of stereotyping, he asserted without fear of contradiction that it was thoroughly exploded for fine works of are on account of the effects which were produced by shrinkage on the fine lines of a picture, but for outline work there could be no doubt of its applicability. He should be glad to hear from Mr. Fitz-Cook whether, as the result of his experience of this process, artists' works had been really and truly reproduced, because he (Mr. Gilks) did not think the specimens round the room afforded sufficient evidence on that point.

Mr. George Cruikshank remarked that he was not at present sufficiently acquainted with this process to be in a position to give a decided opinion upon it, but from what he had heard of it he had no doubt success would ultimately attend it. Very similar results had been produced by a friend of his by a process of drawing or etching upon glass, and it remained to be seen whether the camel-hair pencil or etching point was the better for the purpose. Artists unaccustomed to it would find a difficulty at first in inverting the picture—as, for instance, putting a sword into the left hand, and firing a gun from the left shoulder in the original drawing. The result of his own experience led him to speak in the highest terms of wood engravers generally. He had seen his own drawings almost absolutely reproduced; but such work as that was expensive, and a great many failures might, perhaps, be fairly attributed to the price at which it was necessary the work should be done. He could compliment the wood engravers of the present day in the highest terms, and he sometimes picked up a woodcut in the streets which he took home and preserved as a real work of art. It could not be denied that wood engraving had arrived at a great pitch of perfection, and he did not think it would ever be entirely superseded by this or any similar process; for there were effects in wood engraving which could not be otherwise produced. However, had such a process as this been in existence when he was a boy, instead of riding, as he did, in an omnibus, he would have been seen in a "coach-and-six." He had been much gratified by what he had heard this evening, and he repeated he believed success would attend this process to a certain extent. Wood engraving would never, as he had before observed, be entirely superseded by this or any similar process, because a certain amount of mechanical work would always be required; but even if it should ever take away the occupation of the wood engraver, it would open another field of employment for the same class of artists as draughtsmen, for which it was to be presumed they had for the most part the necessary ability. He hailed this invention as another addition to art in facilitating the immense amount of illustration which was at the present time so great a vehicle of popular education and amusement.

Mr. George Wallis observed that the first question in regard to every new invention was—"Is the principle correct?" and the next—"Can the details which must follow upon that principle be carried out to a practical result?" He apprehended from what he had heard this evening, that both those questions must be answered in the affirmative. The facility of reproduction being thus established, the whole question resolved itself into one of tint drawing, and there was no doubt that, by practice, an artist could soon adapt himself to such a process as this, so as to be able to draw tints that would print, either from the marble block or from a good stereotype taken from it; for when they recollected the skill of wood-engravers in tint engraving, it was not too much to say that artists might arrive at the same perfection in tint drawing after they had had some experience in it. A process of this kind, which brought the public and the artist nearer together, was a great boon, and those who brought it forward deserved thanks. But there must be good drawing, there must be no reliance upon the secondary process of the engraver; the artist himself must produce his own effects, and this process would place the results of his mind and skill directly before the public. He had no doubt Mr. Fitz-Cook had met such people as he (Mr. Wallis) had come in contact with in reference to his own process of autotypography. On one occasion a friend remarked to him, "Then you have to make a drawing after all!" and he had to confess that it was an important condition of the process that the drawing should be made before it could be reproduced. In the process before them a drawing must certainly be made, but, as far as his experience went, he felt convinced that it had within it all the elements of success.

Dr. Bachhoffner hailed this invention as a great boon, which would place in the artist's hands a process which might lead to very important results. Whether it would eventually supersede wood engravings was a question; but in any case it opened up another field for art. There was one observation which fell from the chairman which greatly surprised him. The chairman told them he was a convert, or more properly a "pervert," on the subject of the patent law. He (Dr. Bachhoffner) feared it was a perversion from a good cause to a bad one, inasmuch as if he understood him aright the chairman declared himself to be an opponent of the patent law, and he had remarked that he could not see the application of a patent to lamp-black and glue. He (Dr. Bachhoffner) granted that there could be no patent in respect to the manufacture of those articles, but it was a totally different thing when they came to the application of them to an entirely new process—an original idea which might fairly claim the protection of a patent.

Mr. J. Beavington Atkinson said that if this invention could do all that it professed, it was to the arts of inestimable value. He need not point out the subtle relation which existed between the artist's hand and his mind—the value of even a single touch in a picture, and how readily it might be lost in translation by the engraver. Whether a mere mechanical mode of reproduction could actually preserve those delicate touches, the force of which the artist himself was often almost unconscious of, was a matter of considerable doubt; but it was well worth a fair trial. He should be glad to know whether there was at present any means of transferring photographs to the chalk surface. There were various means, more or less satisfactory—some extremely unsatisfactory—of reproducing photographs, and if this process was applicable to that purpose it would be of the greatest value. The drawings of Raffaelle and Michael Angelo at Oxford were some years ago sent to the Department of Science and Art at South Kensington, to be reproduced by photography. He had anxiously looked for the result, which had hitherto not appeared, although, within the last four months, these drawings had been engraved and published in the ordinary way. If this process was capable of application in the reproduction of the drawings of the old masters, through the medium of photography, a very great boon would be conferred upon amateurs and collectors of such works. It seemed to him, after all, the question was very much one of economy and speed; and if the patentee of this process could produce a really good article at a cheaper rate than formerly, the invention could not fail to be a valuable one.

Mr. George Cruikshank expressed his opinion that the artist who had been accustomed to one kind of drawing, whether in oil or water colour, would never leave it to take up this new process. Owing to etching having gone very much out of fashion, he had long ceased to practice that mode of drawing, and he believed that artists would never resort to anything like mechanical processes while they possessed the power to execute in oil or water colours. There must always be large pictures to be done by the engraver, in which a peculiar talent was exercised, which the artist either did not possess or had not taken the pains to cultivate. He had been repeatedly requested to etch his large picture of the Worship of Bacchus, but, looking to the amount of labour involved, he had declined the task. One matter of importance in connection with this process was the element of price, on which he should be glad to have information.

Mr. Fitz-Cook replied that the cost by this process would be only from one-half to one-fourth that of wood-engraving.

Mr. Noel Humphreys said it was to be borne in mind in reference to this process, that the effect of the picture was produced by distinct and definite lines, which must all be put in by the artist himself; whereas in wood-engraving the effects were to a great extent translated by the engraver. In the process now laid before them the artist must do all for himself, as the brushing operation was effected by purely mechanical means. Besides this it was necessary to employ a camel hair brush in drawing on the chalk in the place of the ordinary pencil, and in order to draw fine lines with such a tool great steadiness of hand and delicacy of touch were essential, which he apprehended could only be attained by long practice. Lithography, however, which gave the precise lines of the artist, had been brought to great perfection where the brush was used. In chromo-lithography it was at first found, where chalk was used for drawing, that the material on which the colours were placed became so charged with the colouring ingredients, that it filled up, and the shading became a mass of blur. Subsequently the drawing was done with a brush in lines, as in wood engraving. He did not say that by proper training and practice good artists could not acquire the power of using the camel-hair brush so as to realise all that could be hoped for; but in the meantime he thought this process was only applicable to the bolder class of drawing, such as the wood-cuts of Albert Durer and other early engravers. His own opinion was that if anything should arise to drive wood engraving out of the market, the fine wood-cuts of the present day would be sought for in after times as being amongst the most exquisite works of art of the age.

Mr. B. Waterhouse Hawkins said he had hoped that the challenge thrown out to the wood-engravers would have provoked them to an explanation of some of the advantages which the wood-engraver still possessed, and, as he believed, for a long period of time would continue to possess, over the various processes which had been introduced, trenching as they did more or less upon that branch of art. In this process the production of fine lines was very difficult upon a material such as chalk, and if they were produced in the first instance he could not but fear they might afterwards suffer injury from the mechanical process of stereotyping. He was therefore surprised that the wood-engravers had not spoken of the advantages they possess in the power of lowering and modulating the surfaces of an engraving, which was lost sight of in the process now described. It was not merely the fineness of the lines or their combination which produced the gradations of tint which characterised the higher class of wood illustrations in the present day. Those gradations of tint could not be dispensed with in order to produce a good picture, and, as far as he knew, they could only be produced under the hands of the engraver, by lowering his surface, so as to have less pressure on those portions which he desired should be light, and giving a full pressure, by contrast, to the darker portions of the picture. For mere forms without tint the process would be inestimable and perfect in its way, but there appeared little prospect at present that it would supersede the beautiful productions of wood engraving which it had taken so many years to bring to its present perfection.

Mr. D. Roberton Blaine said, though not an artist himself, the first thought which occurred to him on entering the room was how any artist, devoting himself to the production of such designs as were now on the walls, would be protected. If the design were an original one, it was clear the labours of the Society of Arts would be most valuable in this respect, in having prepared the Act of 1862. Then again it occurred to him, supposing the design not to be original—how then? It would then come in as a new process of engraving, and so be protected. He entirely agreed with what fell from Dr. Bachhoffner with regard to the patent laws, and he thought it would be a deplorable thing if they were so altered as to do away with that fair and just protection which was now accorded to inventors. He considered every man had a fair claim to be protected in the benefits of his invention.

Mr. Bishop called attention to similar processes of engraving which had come under his notice in the course of his travels. He had himself tried many materials for the reproduction of drawings, but had found nothing so good as lithographic stone, with which, however, the difficulty was to clear away the parts which were not required to be left in relief. The difficulty in all these processes was, as far as his experience went, in getting a perfectly clean line; and he agreed with the remarks of Mr. Hawkins with respect to the effects produced by gradations of the surface of the plate.

Mr. Fitz-Cook, in reply upon the discussion, said he could not do better than refer to the drawing by Mr. Holman Hunt exhibited in the room, which he believed was in itself a sufficient answer to the objection that had been raised as to the necessity for stereotyping. On the background and the face of the female figure there was no graver work whatever, and only a very little on the dress, where one or two shadings required to be removed, and, if such a result could be produced by stereotyping, the process could not be a bad one. With respect to the lowering of the surface in wood engravings, spoken of by Mr. Hawkins, he believed that was almost entirely given up, inasmach as the same effect was produced by "overlaying" and "backing-up" in the printing. There would, however, always be specialities peculiar to wood engraving which this process did not, in all respects, pretend to supersede. With respect to the remarks of Mr. Noel Humphreys, he appeared to apprehend a difficulty in drawing lines on a chalk surface with a brush; but that was only because he had not tried it; for it was as easy to draw on chalk as on paper when the proper ink was employed. In lithography the drawing was more difficult, because the ink stuck on the stone, and there was danger of making the line too thick, or of producing no mark at all. Mr. Humphreys had also expressed a doubt as to whether this process was applicable to printing in colours, but in this it presented no more difficulty than wood engraving; indeed, in many respects, the facilities were greater; for a greater variety of texture in the drawing could be produced.

The Chairman, in proposing a vote of thanks to Mr. Fitz-Cook for introducing this subject to the Society, would notice very briefly two or three points that had been raised. It had been rather complained against this process that the artist was obliged to reverse his drawing. He had to do precisely the same in drawing on wood, and certainly there had been no complaint against wood engraving, as he understood, on this ground. There was, however, no doubt it had special qualities of its own which this process was not likely to rival, inasmuch as there was an absence of the mellowness which characterised high class wood engraving. It was complained that the artist must make his own lines; he must do that in everything; whether on wood or stone the artist must himself do the work. With regard to the use of the camel-hair brush, he might state that a good deal of lithography of the finest description was done by that tool, and, if he was correctly informed, neither Mr. Holman Hunt, Mr. Wallis, nor any of the other artists who had tried the experiment, had found any difficulty or inconvenience in making their drawings on the chalk surface used in this process.

The vote of thanks having been passed,

Mr. Fitz-Cook acknowledged the compliment paid to him.

The Chairman said—Before concluding the business, I feel it right to make an announcement to the members, which I am sure will cause them sorrow. It is the sudden death of a fellow member, well-known to, and appreciated by, many of his colleagues, and greatly distinguished beyond these walls. On Monday last Captain Fowke, R.E., died suddenly, at the South Kensington Museum, of the bursting of a blood vessel. He had been in declining health for some few months, but did not appear to be threatened with any immediate danger. As a man of science, possessing a fertility of invention which amounted to genius, he held the highest rank amongst his brother officers of the Royal Engineers. In the year 1854, before any of the experiments were made in gunnery now so much heard of, he showed me several projects for rifling cannon and firing elongated shot and shell. In the Paris Exhibition of 1855, where he was secretary of the English Commission, he exhibited a canvas pontoon, the like of which was successfully used during the late American civil war, although it has hitherto failed to impress itself upon our own military authorities. At that same exhibition he conducted a series of valuable experiments on the strength of colonial woods, which, in the colony of Jamaica, had the effect of increasing the annual exports of lance-wood spars fourfold, and raising mahoganies from 4,869 feet to 39,474 feet. After the Paris Exhibition he became the engineer of the South Kensington Museum. Popular ignorance tauntingly has often attributed to him the design of the iron building known as the "Boilers," which was the work of the late Sir William Cubitt—and a clever useful work too—who simply designed it as a means of affording temporarily the greatest amount of covered space at the cheapest rate. Capt. Fowke was called upon to design the little picture gallery for exhibiting Mr. Sheepshanks' noble gift of pictures, and for the first time, in concert with Mr. Redgrave, R.A., he, as an architect, demonstrated an accurate formula upon which a picture gallery must be built in order to exhibit pictures without glitter or reflection. He applied a novel principle to the lighting of picture galleries by gas; and, by the use of ingenious machinery, many thousand gas burners are lighted every evening in a few minutes. The Vernon and Turner galleries of the South Kensington Museum were built by him, with fire-proof floors, in the course of eight weeks, in December, 1858, at a cost not exceeding 3½d. a cubic foot, which is rather an unusually cheap rate for a public building. Captain Fowke had an almost unrivalled facility of economising the use of materials in his buildings. His greatest feat in this direction was the construction of a drill-shed for the use of the 1st

Middlesex Engineer Volunteers, of which corps he was the founder. He constructed this shed with semi-circular ribs covered with felt; it measured 100 feet long by 40 feet wide, was upon brick foundations, and the cost did not exceed £100. Showing it to Sir Joseph Paxton once, he guessed the price at three times the cost, and told me that it was the neatest thing in cheap construction he had ever seen. Numerous volunteer corps throughout the country have constructed similar sheds. Captain Fowke has employed a similar principle of construction in the several entrances to the Horticultural Gardens, where they may be seen. He gave the general plan for these gardens, which was subsequently modified in the gardening details by Mr. Nesfield. The design for the conservatory—which I venture to say is the prettiest in existence—as well as the design of the south arcades of the Horticultural Gardens, were made by Capt. Fowke. In the latter, he revived the use of terra cotta, which for more than half-a-century had slumbered in this country. Subsequently, with the aid of Mr. Godfrey Sykes as decorative artist—also a man of great genius —he has introduced it extensively, and with much effect, in the new buildings of the South Kensington Museum. Fortunately for the public service, he had completed, before his death, the greater part of the design for the South Kensington Museum, and it will be quite possible, from the materials which he has left, to carry out his intentions; but the Lord President (Earl Granville) is fully sensible that the department has sustained a very great loss by his death. As architect of the Science and Art Department, he designed the New Industrial Museum in Edinburgh—a very successful building,—and also the interior of the National Gallery in Dublin, in both instances having to design under stringently economical conditions. On a former occasion I explained in this room* the reasons for which he had been chosen as architect of the International Exhibition of 1862. In this case the problem was not to erect a gay building, to last a few months only, but to fill a very large space in such a way, and at a limited cost, that it might hereafter be made permanent. It is obvious he had no funds for decoration. Although, for the purposes of exhibition, the exhibitors pronounced the structure as the most successful for the purpose which had hitherto been made, in respect of lighting, ventilation, and general convenience, the public did not believe that it could be made properly decorative, and the House of Commons declined to purchase it at the cost of the old materials. Looking back dispassionately on the past, I have learnt to think that this was a wise decision, but during the controversy, which bore very hard upon the architect, it was impossible that any man could show higher qualities of patience, resignation, and gentlemanly bearing than did Captain Fowke, and at last the public made amends to him for its injustice. In an open competition to the world, in which some of the most eminent architects competed, the five judges, of whom three had taken an active personal part in causing the pulling down of the exhibition building, unanimously awarded to his design the first prize, and the architectural press and public fully confirmed the decision. We may hope to see this magnificent design properly realised. Moreover, in the forthcoming Paris Exhibition, the exact proportions and size of the picture galleries of the Exhibition of 1862 have been avowedly adopted as incapable of improvement. I firmly believe that the arts of construction in this country have sustained a great loss by Captain Fowke's death. At this period, when Art is so transitional, and Science is making so many discoveries, and men's minds are seething with inventions; when the use of new materials is being constantly manifested, and the new adaptation of old materials is constantly entered upon, England has lost a man who felt the spirit of his age, and was daring enough to venture beyond the beaten path of conventionalism. Captain Fowke, to my mind, was solving the problem of the decorative use of iron, and, by appreciating the spirit both of the Gothic and Renaissance architects, was on the threshold of introducing a novel style of architecture, when—alas!—Death, at the early age of forty-two years, has cut short his promising career.

Proceedings of Institutions.

Liverpool Institute.—Mr. Astrup Cariss, the Secretary of the Liverpool Institute, has resigned this office, which he has filled with ability and credit for a period of more than eleven years. The Board of Directors, on receiving his resignation at their last monthly meeting, passed a resolution expressing their regret, and their sense of the zeal, energy and efficiency with which he had discharged his duties.

Macclesfield Useful Knowledge Society.—The annual general meeting was held on the 8th of November, Mr. E. C. Egerton, M.P., in the chair. Mr. Nicholson, the secretary, read the report, from which it appears that the society possesses more members than it did last year. The list is as follows:—Honorary, 171; ordinary, 218; friends and junior members of classes, 115; making a total of 504. The decrease in the number of the honorary members is accounted for by 19 withdrawals, 11 removals from town, and 9 deaths; 13 new honorary members have been added. Thus the increase in the total number is obtained by additions to the ranks of the ordinary members and to the classes. The classes are now constituted as follows, the numbers giving the average attendance:—Arithmetic and geometry, 34; reading and writing, 33; grammar, 13; history and geography, 25; French, 11; phonography, 11; general instruction (female), 27; sewing (ditto), 18; general instruction (junior), 44. The students have submitted during the past year to the following examinations:—1st. The Elementary of the Lancashire and Cheshire Union of Institutes; 2nd. The Final of the Society of Arts; 3rd. The Government Department of Science and Art; and, 4th, the local one. In the Union examination ten certificates were awarded. The results of the Society of Arts' examination have already appeared. The local examinations were most successful, and the examiners' reports were generally favourable. The science classes have recently commenced their session; they have been opened free to members of the society, and at a very low charge to non-members. The subjects selected for this session are "Sound, Light, and Heat," and "Inorganic Chemistry." Geometry is a subject but lately added to the class list. The French class is now open to members who are of the artizan class without any extra fee. A field naturalists' class has also been established, and doubtless will prove, during the coming year, a great source of attraction from the numerous interesting fields open to its investigation. The committee congratulate the society upon the great prosperity and usefulness of the classes; the class-rooms are often inconveniently full, and many more might be accepted as members if accommodation could be provided. It is believed that there never was a period when the society's educational operations were more usefully adapted or more satisfactorily conducted than at the present. In consequence of the Electric Telegraph Company advancing their charge from £40 to £60 per annum, it was decided, at a general meeting of members held last December, to discontinue the receipt of telegrams. The circulation of works from the society's library has been 9,800, and from Mudie's library (to which the society has subscribed in the absence of the telegrams), 1,388—a total of 11,188. From the limited funds at the disposal of the committee, they have not felt justified in making a greater addition to the library than some 50 volumes. The total number of volumes in the library now is about 5,000. The committee thank various members for donations, and record a severe loss to the society in the deaths of two of its vice-presidents—Messrs. Thomas Brodrick and William Potts. The financial statement for the year gives the following results:—Receipts, £473 0s. 10d.; expenditure, £556 15s. 9d.; balance due to treasurer, £83 14s. 11d. The School of Design report states that the number taught drawing has been for the year 841—97 in the Central School—divided thus: 22 ladies, six pupil teachers, four free and 65 general students, and 744 in the schools of the town. Nearly 500 presented themselves for examination in freehand drawing, geometry, perspective, model drawing, &c., and 402 were successful—gaining boxes of colours, boxes of instruments, drawing boards, T squares, certificates and cards. The students of the Central School have also obtained nine medals, and one national medallion or Queen's prize.

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* Vol. X., p. 55.

BRITISH ASSOCIATION, 1865.

On the Effect of Blowing Blast Furnaces with Blast of very High Temperature.

In Section G, Mr. E. A. Cowper read a paper, of which the following is the abstract:—

The author said he would not detain the meeting with a history of the numerous attempts which have been made to raise the blast of blast furnaces to a very high temperature, nor would he occupy much time in the description of the means by which the desired result has been obtained, as a full account of the apparatus was given at the meeting of the Association held at Oxford (though the paper on the subject was not printed in the Transactions). In 1861, experimental stoves only on the new plan had been erected, and worked for heating the blast for one tuyere, out of the fire used for one blast furnace. Such satisfactory results were, however, obtained, that it was clear that the difficulty of procuring blast of very high temperature had been overcome; and Messrs. Cochrane and Co., of Woodside Ironworks, Dudley, and Ormesley Ironworks, near Middlesbro'-on-Tees, forthwith erected large stoves on the new plan for a complete blast furnace; and it is now proposed, with your permission, to lay before the section the results obtained during upwards of four years' practical working with these stoves.

The effect of heating air on the new plan was that a temperature of blast of 1,150 deg. Fahr. was obtained, instead of only 600 or 700 deg. as with cast-iron pipes in the common stoves. There was no loss of blast from leakage, owing to cracked or damaged cast-iron pipes; the iron produced was of rather better quality; 20 per cent. more iron was made from the same furnace; and fully 5 cwt. of coke was saved in the blast furnace per ton of iron made.

The details of the construction of the new stoves were shown by drawings. First, there are two stoves, which are heated alternately, and used alternately in heating the cold air; these are filled with brickwork, "set open" (or small spaces between the bricks), and form "regenerators," on the principle of Mr. Siemens's regenerator furnaces, as now so largely and successfully used in glass houses, gas works, iron works, &c., both for obtaining great heat and economising fuel. The outsides of the stoves are of thin wrought-iron plate, lined with fire-brick, the iron skin being necessary to retain the blast under pressure, whilst the fire-brick resists the heat. Second, there are provided for the purpose of heating the stoves, valves for the admission of gas and of air into a central flue, where combustion takes place when a stove is being heated, the products of combustion passing up the flue and down through the mass of fire-bricks forming the regenerator, and escaping at the bottom to the chimney, after the whole of the heat has been abstracted by the fire-bricks, the temperature of the chimney being from 212° to 250°, or thereabouts, during the time a stove is being heated, viz., for a period of four hours. Then when a stove is hot, the gas and air are turned off, the chimney-valve shut, and the cold blast is turned on at the bottom of the regenerator, and passes up through the bottom courses of brickwork in the regenerator, thus very quickly becoming heated, and passing in this heated state up through the remaining courses of hot brickwork, and down the central flue through the hot-blast valve to the blast furnace, the process of absorption of heat by the air being so perfect that as long as a few of the top courses of brickwork remain hot, the blast is well heated, the variations in the temperature of the blast being only about 100 degrees Fahrenheit, with four hours' changes. Thirdly, the gas for heating the stoves was supplied from gas producers, similar to those commonly used by Mr. Siemens for his regenerator furnaces, and which have already been described before this Association. They consist of a simple brick enclosure or fireplace, with bars near the bottom, for the admission of a very small quantity of air. The gas is formed by the slow combustion of a very thick fire, supplied with poor coal or slack down a slope or hopper, the gas passing off from above the fuel through pipes to the hot blast stoves. Gas may, however, be taken from the top of the blast furnace for heating the stoves, provided proper arrangements are made to separate it from the dust which comes over from the blast furnace with it; and, judging from recent practical experiments, it is certain that there are several ways in which this may be done with perfect success.

The late Mr. James Beaumont Neilson, who did so very much for the iron manufacture by his original invention of the hot blast in 1822, was sufficiently long-sighted to predict the advantages that would flow from the use of blast of very high temperature, though, as it happened, he was limited to what could be obtained from passing the air through iron pipes exposed to a fire, as in common stoves. Mr. Neilson said: "In the new regenerator ovens that had just been described, the great capacity of fire-brick for heat had been well taken advantage of, and a very important step in advance had been made by giving the means of raising the temperature of blast much above the extreme limit practicable with the old ovens; and he considered this would be productive of the greatest benefit in the working of the blast furnace—he had no doubt the 'make' of iron would be considerably increased by the higher temperature of blast given by the regenerative ovens." These anticipations have been fully borne out in practice during upwards of four years' regular working of the stoves. The high temperature of the blast produces such an improved effect in the furnace, that the "burden" is increased so as to save fully 5 cwt. of coke per ton of iron made; and as there is less fuel supplied, so there are less impurities taken in, and the quality of the iron is improved, the tuyere breasts do not work hot or burn, or give more trouble than usual, as the burden is increased as just stated. The same furnace is of course enabled to do more work, the "make" being increased fully one-fifth, so that a given plant produces 20 per cent. more iron per annum, besides saving nearly three shillings per ton for coke. There is less friction or loss of pressure of blast in these stoves than in common ones; and there is no loss of blast by leakage through cracked or burnt cast-iron pipes or joints. More stoves are now being erected on the same plan."

Mr. Siemens said that the application of regenerators which Mr. Cowper had brought before the meeting was one of the most interesting which could have been made. He had provided the means of heating blast nearly up to the temperature at which bricks would melt. Mr. Siemens defined the chemical process effected by Mr. Cowper's arrangement, and affirmed that there was no deterioration of the quality of the iron produced by that process.

Fine Arts.

Paris Exhibition of Fine Arts, 1866.—An impression has got abroad that, with a view to the Universal Exhibition to be held in 1867, there would not be an exhibition of the works of living artists in Paris next year; this report, however, was officially contradicted, and the regulations for the *salon* of 1866 have now been published. Th Exhibition is to open as usual on the 1st of May, and to close on the 20th of June. The number of medals to be given is forty-nine in the section of painting and drawing, fifteen in that of sculpture and medal engraving, six in that of architecture, and eight in that of engraving and lithography. An important alteration has been made, however, with respect to the two great extra prizes—medals of honour, of the value of 4,000 francs each, awarded for the best picture and the best sculptural work, when the judges are of opinion that any in the exhibition merit this special honour. Medals of honour were awarded this year to M. Cabanel, for his portrait of the Emperor, and to M. Paul Dubois for his statue of a young Florentine of the fifteenth century, singing and accompanying himself on the lute. On former occasions these, as well as the ordinary medals, have been awarded by the jury previous to the opening of the exhibition, and, of course, in the case of such a marked honour, a considerable amount of discussion, not to say jealousy, is called forth; a change is now to be made, both as regards the composition of the jury and the period of the awards. It is the practice at these exhibitions to close the *salon* for a few days about the middle of the term, and to re-arrange the pictures and other works of art, in order to afford an opportunity for revising the whole, and bringing meritorious productions into better or different positions. This practice will be continued, and the medals of honour will not be awarded, nor the ordinary medals announced, until after such revision; moreover, the former will not be determined by the jury, but by a vote of the whole of the exhibiting artists who have received honours at former exhibitions, that is to say, one of the new medals, of the value of 400 francs, one of the first-class medals under the former regime, or the Cross of the Legion of Honour. By this arrangement the medals of honour will be conferred by the *élite* of the artists themselves, and after public opinion has had full opportunity of expression. The Jury of Admission, and which awards the ordinary medals, is now elected by the body of artists, so that the whole of the honours are in reality distributed by the suffrages of the artistic community, though not directly, as will be the case next year with the grand medals of honour. It seems impossible to carry the principle of reform further than this, every artist who has himself achieved the reward of merit having a voice in the distribution of the same among his fellow-artists. One other judicious change has been made in the regulations—heretofore, every artist who had obtained a medal in any section of art was exempted from the action of the Jury of Admission; in future, such exemption, as well as the right of voting for the jury, will only apply to the special section in which the medal or decoration was obtained, so that painters, sculptors, engravers, and other artists will not interfere with the awards out of their own line. This limitation does not, however, appear to apply to the vote for the two great medals of honour. The number of artists who voted this year for the jury was only 202, a very small number out of so large a body, but the result was perfectly satisfactory as regards the jury elected.

Commerce.

Sugar.—The increase in the consumption of sugar is continuous. In 1864, from a variety of causes the quantity delivered in the first ten months was comparatively small, and the increase for the present year to the end of October amounted to no less than 13·5 per cent. In 1863 these exceptional causes did not operate, but, in consequence of this year's low prices, the increase for the ten months of 1865 over 1863 has been no less than nine per cent.

Coffee.—The Board of Trade Returns for the ten months ended 31st October, 1865, when compared with the corresponding period of last year, show that in imports there is an increase for the present year of 6,640 tons; in exports also an increase is shown of 7,510 tons; and for home consumption there is a decrease of 350 tons.

The Extension of Trade.—Much food for cautious reflection (say Messrs. Travers) is furnished by the Board of Trade Returns, just published. Our Exports during October were the largest ever known in that month, and exceeded those of October, 1864, by 20 per cent. At the same time, it appears there is now a prospect that the entire trade of the year 1865 will surpass that of any upon record. During the earlier months there was a considerable falling off as compared with last year; but latterly the totals have been enormous, and the result is, that the aggregate value of our shipments for the ten months, to the 31st of October, show an amount only $\frac{3}{4}$ per cent. below those of the same period of 1864. Should the return for November and December keep pace with the recent ones, they will bring the figures for the year to a point never before attained. In any case, the important fact has even at present been reached, that the *profits* from our Exports have been beyond all precedent. The extraordinary totals were greatly swollen by the enhanced prices of the leading staples of which our manufactures are composed; but the totals now presented represent a much smaller value of raw material, and a much greater value paid for labour. Of several descriptions of goods we have shipped twice the quantity of last year, at an increase of cost of only about one-fourth. At the same time there has been undiminished employment for our shipping, the American marine not having yet, to any material extent, recovered from the displacement it experienced during the war. That all this prosperity has thus far been actual, as well as apparent, there is every reason to believe. To the question whether it will last, the answer cannot be so positive. That the trade of the coming year will rival or excel even that of 1865, at all events during its earlier months, is hardly to be doubted. Indeed, a great increase may be expected, and it is in that fact that danger lies. Such profits as have lately been gained were never yet realised without leading to inflation, and it will be against all experience if we are not now approaching a period of comparative recklessness. Both in the eastern and western hemispheres, as well as at home, symptoms of this are already apparent. The speculative ardour at Bombay was but temporarily checked by the revulsion in the spring and summer: and at New York the merchants seem to have no idea but that the population of the United States will be able to go on giving orders to any extent for foreign goods, the cost of which is doubled by the existing tariff, while the Southern States have a long period of trial and disorganisation to pass through, and those of the North are unable, as it now appears, to compete with the States of the Continent of Europe in the English grain market.

Colonies.

Queensland Population.—The population of Queensland on the 31st December, 1864, was estimated to have consisted of 45,516 males, 28,520 females, and the total number of persons to have been 74,036. The mean population of the year is calculated to have been 41,548 males, 26,290 females; total, 678,38 persons. The total increase in population which took place during the year 1864 was 12,396 persons, and the portion of this increase arising from the greater number of births than of deaths was 1,437 persons—572 males and 865 females.

Comparing these figures with the mean population of the year as given above the annual ratio of increase from natural causes alone is, of males, 1.38; of females, 3.29, and of persons, 2.12, which is exactly one per cent. higher than the average English rate.

CATTLE DISEASE IN NEW SOUTH WALES.—A colonial journal says that meat is at an unusually high price in this colony. Fat stock are scarce, and it has been difficult to get them to market in fair condition. The scarcity of cattle has been promoted by a visitation of the disease known as pleuro-pneumonia. This disease committed a good deal of devastation, and led to the destruction of many more cattle than would have died of it. Stockholders were alarmed, and rushed their beasts to the shambles while they were alive and still saleable—the breeding stock as well as the bullocks being consigned to the butcher. A great many cattle runs have been turned into sheep runs. This was partly because it was thought that sheep were paying the best, and partly because the system of free selection in land was more damaging to a cattle run than to a sheep run. For a time beef was low in price, now there is a reaction, and the price threatens to run high for some time to come.

COPPER MINES IN NEW SOUTH WALES.—At the present time a perfect *furore* for copper mining prevails in the Western districts, and rich veins of copper have been traced from the Canoblas mountain range, that divides the Lachlan watershed from that of the Macquarie, to Carcoor on the south, and to Ophir on the north, or over an extent of country fifty miles in length. The principal copper mine as yet at work is that of Cadiangalong, on the southern watershed of the Canoblas, and about sixteen miles from Orange. It employs when in full work two hundred and fifty hands. The smelting works at Cadiangalong are very complete, and work up about 200 tons of ore per month, returning on an average about 30 tons of pure copper. The Carangara copper-mine is about eighteen miles distant from Cadiangalong, in a northerly direction. The mines have been opened for some years, and smelting works were erected on them. But the mistake was made of putting up blast furnaces, and the company found they could not get a sufficient per centage of copper to pay. The ores are gossan ores to the ten-fathom level, when the sulphurets commence. In the Southern district a copper-mine has been opened at Curawong, twenty-two miles south from Goulburn, and about seven north of Collector. It is as yet only in its infancy, but a valuable vein of black ore has been struck at a depth of seven fathoms. There are also numerous veins of gossan ores traceable on the surface.

PETROLEUM SHALE IN NEW SOUTH WALES.—A Sydney paper says that companies have been formed there, and their operations are proceeding with the fullest confidence of success in the development of a source of wealth which has been hitherto unknown. The shale coal, ascertained to exist in abundance throughout certain parts of the colony, particularly in the district of Harley, and the bituminous qualities of which have been well tested, is one of the resources of the country which yet remain to be fully examined. At present the discovery is scarcely known beyond the limits of those who are engaged in its development.

Publications Issued.

JOURNAL OF SOCIAL SCIENCE. No. 1. Edited by Edwin Lankester, M.D., F.R.S.—This journal, just started, has for its object the recording the proceedings of the Annual National Association for the Promotion of Social Science, as well as circulating the papers read at its London meetings, and of supplying original papers and information generally on the subjects embraced by the Association. The present number contains the proceedings of the Sheffield meeting of the Association, papers "On the Outbreak of Cholera in Egypt," by Dr. Tilbury Fox; "On the Cattle Plague," by Professor Gamgee; "On the Protective Duties of America," by J. Noble; and "On the Examination of Girls." There is a review of local sanitary legislation and a monthly chronicle of matters connected with the cattle plague—Cattle Plague Commission—Cholera at Thornton Bois, near Epping—Mortality of Children in Manufacturing Districts—the Ladies Medical College—Thomas Carlyle on Education in Natural Knowledge. A summary of the proceedings of societies and correspondence completes the work.

Forthcoming Publications.

THE MIRROR OF SCIENCE (*office*, 147, *Fleet-street*) will shortly be published, size 16 quarto pages, illustrated, being a weekly miscellany of entertaining and instructive articles on photography, chemistry, electricity, &c. Price 2d. weekly.—The object of this publication is to provide a record of the progress of science all over the world, but in its pages room will be given to photograpy, electricity, chemistry. astronomy, the telescope, and the balloon; to discoveries relating to animal, vegetable, and insect life; to the microscope; land and ocean telegraphy, magnetism, and the collateral sciences and arts. It is intended by the editor to devote some of its columns to the use of subscribers for scientific notes and queries.

Notes.

POULTRY IN FRANCE.—An exhibition of fat poultry, as well as of cheese—the latter international—is announced to take place in Paris on the 18th to 21st of December in the present year; gold, silver, and bronze medals, together with a sum of 5,000 francs, for small premiums, are placed at the disposal of the juries. Poultry has always been a very important article of consumption in France, and it becomes more so every year; in 1788, the consumption of Paris was estimated by M. Tessier at 2,266 tons per annum, including game; in 1817 it had reached twice that amount; in 1825 it was nearly 6,000 tons; and in 1864 it amounted to about 13,000 tons. The following are the items of the return:—

	Heads.
Fowls	4,500,000
Rabbits	1,700,000
Pigeons	1,700,000
Geese	700,000
Ducks	700,000
Capons	400,000
Turkeys	400,000
Kids	50,000
Total	10,150,000
Larks	1,700,000
Partridges	625,000
Hares	200,000
Thrushes	80,000
Pheasants	40,000
Snipes, quails, and woodcocks	50,000
Venison	7,000
Wild ducks	45,000
Plovers, landrails, &c.	9,000
Various	120,000
Total	2,876,000

The average consumption for the population of Paris has risen from less than eight pounds, in 1788, to about twenty pounds, in 1864, per head per annum. The total value of the poultry and game consumed in Paris is given, for 1840, at about £320,000; for 1845, at £400,000; for 1850, £480,000; for 1855, £680,000; for 1860, £880,000; and for 1864, £1,040,000; and, with slight exceptions, the progression has been uninterrupted, the increase since 1848 having been equal to £40,000 per annum. The whole of the poultry and game consumed in Paris passes through the market of La Vallée, on the South side of the Seine, and the municipality of Paris derives a very large income from octroi and other taxes; in twenty years these produced twenty-four millions of francs, and in the year 1860 nearly two millions. All poultry and game sent to the market pays 10 per cent. *ad valorem*, and that which is directed to individuals pays an octroi tax of 15 per cent. for geese, turkeys, tame rabbits, lamb and kid —which are classed with poultry—and of 30 per cent. for all other kinds. The trade is a close monopoly, there being but eight licensed factors, who receive one per cent. *ad valorem* on all the poultry and game sold in the market, whether by themselves or the proprietors; a factor's privilege is worth from £4,000 to £6,000, and yields an average income of £600. The following are the localities most famous for poultry:—Toulouse, Le Mans, Mortagne, and Strasbourg, for geese; the Oise, Somme, Pas de Calais, and the Nord for pigeons; the Loire-Inferieure, Sarthe, Seine-et-Oise, Indre-et-Loire, L'Eure, and Loiret for ducks; the Cher, Aube, Indre-et-Loire, Loiret, Seine-et-Marne for turkeys; Sarthe, Calvados, Oise, Somme, Seine-et-Marne, and Seine-et-Oise for fowls, and the first two especially for capons.

GRAPHITE.—The *Russian Correspondence* announces that a stratum of graphite (blacklead for pencils) has recently been discovered near the sea of Azoff, equal in quality to that of Siberia.

To Correspondents.

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ERRATUM.—In last number, page 47, column 2, line 4 from bottom, for "lighting" read, "tilting."

MEETINGS FOR THE ENSUING WEEK.

MON. ...Geographical, 8½. 1. Rev. W. Ellis, "On Ankova, the Central Province of Madagascar, and on the Royal or Sacred Cities." 2. Captain W. Rooke, R.A., "A Boat Journey Along the Coast Lakes of East Madagascar."

TUES. ...Civil Engineers, 8. Mr. John Grant, "Experiments on the Strength of Cement, chiefly in reference to the Portland Cement used in the Southern Main Drainage Works."
Zoological, 8½.
Photographic, 8.
Syro-Egyptian, 7½.
Ethnological, 8. Mr. John Crawfurd, "On the Oriental Negroes—namely, Andaman Islanders, Papuans, Feejeeans, &c."

WED. ...Society of Arts, 8. Mr. J. C. Morton, "On London Milk."

Patents.

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From Commissioners of Patents Journal, December 1st.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—3004—S. Hunter.
Bilge water, discharging—3001—A. V. Newton.
Bottle fountain—2847—J. Nadal.
Bottles, machine for drawing corks from—2844—H. J. Sanders.
Bricks—2915—E. Guthrie.
Bricks or building blocks—2967—L. G. Speyser.
Capsules—2093—W. Betts.
Caramel—2950—A. V. Newton.
Cast iron, process for hardening—2964—W. E. Newton.
Cement—2863—T. Grayson and J. O'Donoghue.
Cigars or tobacco, apparatus for igniting—2868—H. Bateman.
Cisterns, liquid sealing to the covers of—2986—G. P. Hemming.
Coats, &c., draughting patterns for—2955—J. H. and G. R. Smith.
Coffee, roasting of—2951—A. V. Newton.
Cooking apparatus—2971—S. H. Huntly.
Cotton seed, taking the fibre from—2956—W. H. Cope.
Currants, &c., cleaning or dressing—2978—A. Rickett.
Dress, bows or ties for articles of—2975—I. Lazarus.
Feathers, bleaching—2987—W. Clark.
Fibrous substances, preparing, &c., of—2778—J. Combe.
Fibrous substances, spinning and doubling—2980—J. B. Edge & E. Hird.
Fire-arms, breech-loading—1894—W. L. Penotière.
Fire-arms, breech-loading—2958—J. R. Cooper.
Fresh water from salt and impure water, obtaining—2953—S. H. Huntly.
Friction matches and tapers—3002—S. A. Bell.
Furnaces—2682—W. Beardmore.
Furnaces—2963—T. M. Tennant.
Gas—2965—J. Harbert.
Guns, breech-loading—2981—C. Whitney.
Gymnastic exercises, apparatus for—2767—G. W. Bacon.
Hair-brushing apparatus—2994—G., G. and C. W. Smith.
Hydraulic presses—2698—T. Routledge, D. Bentley, and J. B. Jackson.
Hydro-carbon fluids, lanterns for burning—2809—E. A. Phillips.
Iron, &c., separating phosphorus from—2482—C. H. L. Wintzer.
Iron, sheet, cutting—2989—R. and T. E. M. Walters.
Iron washers, bevilled or convex—2957—G. Carter.
Knitting-machine needles—2960—W. Clark.
Liquids, measuring the flow of—2968—W. Payton.
Locks—2991—F. Pope.
Metallic wheels, moulds for casting—2959—T. J. Perry.
Ordnance—2795—W. Deakin and J. B. Johnson.
Photographs, rests employed in taking—2949—O. Sarony.
Railway carriages—2394—J. H. Johnson.
Railways, safety apparatus for preventing accidents upon—2930—W. E. Newton.
Railway tickets, stamping—3005—A. Lancefield.
Railway train, communication between passengers, guard, and driver of a—3003—W. Birt.
Safe and other doors, fastenings for—2979—J. B. Fenby.
Sewing machinery for using waxed thread—2748—A. V. Newton.
Sewing machines—2784—W. and E. Westmoreland.
Sewing machines—2974—H. Clifton.
Sewing machines—2988—J. Pitt.
Shawls—2961—R. A. Brooman.
Soap—3007—J. J. Field.
Spinning machinery, pressure to rollers of—2995—T. R. Harding.
Spongy metals, production of—2106—J. H. Johnson.
Steam, condensing exhaust—2996—A. V. Newton.
Steam, &c., cocks for—2990—S. Bennett.
Steel—2870—F. Prange.
Tenons, cutting—2911—W. T. Hamilton.
Vessels, steering gear for—2865—W. Esplin and J. Clarke.
Volatile liquids or fluids, obtaining artificial light from—2998—W. Wells and S. Marland.
Weaving, power looms for—2947—M. Caton and H. Holden.
Windows, sash fastening for—2997—W. Parsons.
Wool, detergent solution used in cleansing—1932—J. H. Johnson.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Fire-arms, breech-loading—3013—E. G. Lamson.

PATENTS SEALED.

1528. E. Eastman.
1530. W. Townend.
1533. C. de Bergue.
1534. T. Gentle and J. Allmark.
1535. P. Coombes.
1536. A. J. Aspinall.
1538. J. Robertson.
1539. J. H. Johnson.
1540. R. A. Brooman.
1547. D. Barker.
1550. R. A. Brooman.
1551. A. and A. W. Pemberton.
1555. V. Duterne.
1557. W. Tongue.
1563. S. B. Tucker.
1565. S. Stell, T. Broughton, and F. Hall.
1610. W. Edson.
1611. G. E. and J. Keats.
1618. V. Poitevin.
1621. W. Clark.
1656. W. Clark.
1658. J. Scholl.
1665. W. Clark.
1668. C. H. Gardner.
1689. R. Eastman.
1773. J. Braithwaite.
2152. J. Bowden.
2221. W. P. Gregg.
2245. O. Bennett.
2312. W. E. Newton.
2314. J. Casthélaz and N. Basset.
2349. S. Wales.

From Commissioners of Patents Journal, December 5th.

PATENTS SEALED.

1558. T. Smith.
1560. J. Ferguson and R. Miller.
1571. W. W. Hulse.
2153. G. G. Dennis.
2315. G. T. Bousfield.
2469. G. T. Bousfield.
2485. B. Wren.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3215. T. Waller.
3188. J. T. Caird.
3259. R. Hornsby.
3326. T. E. Vickers.
3310. S. B. Whitfield.
3214. G. F. Griffin.
3243. C. F. Claus.
3249. H. Swan.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2964. R. Hornsby.
2734. J. Coulson.
2746. G. W. Bales.
2751. L. Bissell.
2757. W. Robertson and J. G Orchar.
2837. C. Hodgson.